



EPA Region 7 TMDL Review

TMDL ID: NE1-10000, NE2-10000, NE2-10600, NE2-12100, NE-12130, NE2-12200, NE2-12330, NE2-12500 and NE3-10000

Water Body ID: NE1-10000, NE2-10000, NE2-10600, NE2-12100, NE-12130, NE2-12200, NE2-12330, NE2-12500 and NE3-10000

Water Body Name: Nemaha River Basin (10 tmdls)

Tributary: Weeping Water Creek, Muddy Creek, Turkey Creek, Rock Creek, and South Fork Little Nemaha River.

Pollutant: *E. coli* and Atrazine (NE2-10000 only)

State: Nebraska

HUC: 10240001, 10240005, 10240006, 10240007 and 10240008

BASIN: Missouri

Submittal Date: June 26, 2007

Approved: Yes

Submittal Letter

State submittal letter indicates final TMDL(s) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act.

The TMDLs for Nemaha River Basin were formally submitted by the Nebraska Department of Environmental Quality (NEDQ) in a letter received by EPA on June 26, 2007. Revisions to Nemaha River Watershed TMDL were submitted by email August 13, 2007.

Water Quality Standards Attainment

The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards.

The TMDL target is based on the numeric water quality criteria for *E. coli* bacteria of $\leq 126/100\text{ml}$ as a 30 day geometric mean. The loading capacity (LC) is based upon flow position in the hydrograph and is defined by:

$$LC = \text{Flow} \times 126/100\text{ml} \times C$$

The TMDL target is based on the numeric water quality criteria for atrazine of 12 ug/L. The load allocation (LA) assigned is based on the stream flow volume and is defined by:

$$LA = \text{Flow} \times 12 \text{ ug/l} \times C$$

The TMDL and allocations are set at a level adequate to result in attainment of applicable WQS.

Numeric Target(s)

Submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

The pollutant causing the impairment(s) of the WQS and designated beneficial use is *E. coli* bacteria. Designated uses assigned to the above identified segments include: primary contact recreation; aquatic life Warmwater Class A and B; agriculture; public drinking; industrial water supply class A; and Aesthetics (NDEQ 20026). Excessive atrazine and *E. coli* have been determined to be impairing the aquatic life and primary contact recreation beneficial uses, respectively. The applicable water quality criterion is a recreation season May 1 – September 30 geometric mean of 126/ 100ml for *E. coli*.

Excessive atrazine has been determined to be impairing the Class A – Warmwater aquatic life protection beneficial uses for segment NE2-10000. Assessment of the data and the TMDL are based on the chronic criterion of 12 ug/l. The applicable water quality criterion will be targeted to the May-June time frame for atrazine as that is the period exceedances occur.

Numeric Target(s) and Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety that do not exceed the load capacity.

The TMDL target is based directly on the numeric water quality criteria for *E. coli* bacteria of 126 cfu/100 mL, a 10% margin of safety (MOS) has been assigned. The LA is $\leq 113/100\text{ml}$. All dischargers have a WLA of $\leq 126/100\text{ml}$; non dischargers have a WLA of zero (0).

The TMDL target is based directly on the numeric water quality criteria for atrazine of 12 ug/l. The WLA and natural backgrounds are set at zero (0). The LA is based on stream flow volume. The entire LC is the LA, an example at the 50%, flow of 361 cfs the LA would be 10.61 kg/day for atrazine.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, non point and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered.

Several nonpoint sources of *E. coli* exist in the Nemaha River Basin. These sources include: failing septic tanks or other on-site wastewater systems; run-off from livestock pastures; improper or over-application of biosolids (wastewater treatment facility sludge, septage or manure); and urban stormwater runoff not regulated by an NPDES permit. Permitted facilities in the watershed are listed in the table below.

NPDES Permitted Facilities in the Nemaha River Basin

| Recreation Segment | Receiving Water | Facility | NPDES Permit Number | Facility Design Flow (cfs) | Facility Discharge Directly to Recreation Segment? | Approximate Distance to Recreation Segment (stream miles) | <i>E. coli</i> Fecal coliform Limits in NPDES permit? |
|--------------------|-----------------|-------------------------|---------------------|----------------------------|--|---|---|
| NE1-10000 | NE1-10000 | Brownville WWTF | NE0050890 | 0.062 | Yes | | Yes |
| | NE1-10000 | Nebraska City WWTF | NE0027774 | 3.265 | Yes | | Yes |
| | NE1-10000 | Plattsmouth WWTF | NE0040282 | 1.392 | Yes | | Yes |
| | NE1-12800 | Nehawka | NE0032107 | 0.034 | No | 10.7 | No |
| | NE1-12800 | Union WWTF | NE0045055 | 0.070 | No | 8.6 | No |
| | NE1-12800 | Weeping Water WWTF | NE0113131 | 0.309 | No | 12.5 | No |
| | NE1-12840 | Avoca WWTF | NE0112984 | 0.039 | No | 23.7 | No |
| | NE1-12920 | Manely WWTF | NE0046116 | 0.015 | No | 25.3 | No |
| | NE1-13100 | Elmwood WWTF | NE0023914 | 0.309 | No | 34.7 | No |
| | NE1-13700 | Beaver Lake Association | NE0046159 | 0.681 | No | 1.5 | Yes |
| | NE1-13700 | Murray WWTF | NE0112062 | 0.080 | No | 4 | Yes |
| NE2-10000 | NE2-10000 | Falls City WWTF | NE0112127 | 1.14 | Yes | | No |
| NE2-10600 | NE2-10600 | Verdon WWTF | NE0021148 | 0.232 | Yes | | No |
| | NE2-10800 | Stella WWTF | NE0031844 | 0.067 | No | 1.2 | No |
| | NE2-10900 | Johnson WWTF | NE0037001 | 0.070 | No | 20 | No |
| NE2-12130 | NE2-12130 | Pawnee City WWTF | NE0042340 | 0.278 | Yes | | No |
| | NE2-12140 | Steinauer WWTF | NE0021245 | 0.032 | Yes | 8.1 | No |
| NE2-12200 | NE2-12200 | Dawson WWTF | NE0025399 | 0.032 | Yes | | No |
| | NE2-12200 | Humbolt WWTF | NE0046256 | 0.387 | Yes | | No |
| | NE2-12420 | Table Rock | NE0042048 | 0.048 | No | 0.6 | No |
| NE2-12500 | NE2-12500 | Sterling WWTF | NE0021121 | 0.096 | Yes | | Yes |
| | NE2-12500 | Tecumseh WWTF | NE0021725 | 1.934 | Yes | | No |
| | NE2-12600 | Adams WWTF | NE0024279 | 0.124 | No | 6.8 | No |
| | NE2-12610 | Firth WWTF | NE0045314 | 0.09 | No | 12.9 | No |
| | UD to NE2-12700 | Panama WWTF | NE0112241 | 0.04 | No | 13.4 | No |
| NE3-10000 | NE3-10000 | Auburn WWTF | NE0040967 | 0.572 | Yes | | No |
| | NE3-10000 | Nemaha WWTF | NE0023868 | 0.027 | Yes | | No |
| | UD to NE3-10000 | Talmage WWTF | NE0121304 | 0.155 | No | 0.8 | Yes |
| | NE3-10100 | Shubert WWTF | NE0112526 | 0.029 | No | 6.2 | No |
| | NE3-20300 | Cook WWTF | NE0030911 | 0.540 | No | 10.8 | No |
| | NE3-20400 | Burr WWTF | NE0025461 | 0.309 | No | 19 | No |
| | NE3-20500 | Douglas WWTF | NE0028118 | 0.028 | No | 27 | No |
| | NE3-30000 | Syracuse WWTF | NE0027928 | 0.511 | No | 12.5 | No |
| | NE3-30000 | Unadilla WWTF | NE0046329 | 0.087 | No | 18.3 | No |
| | NE3-30000 | Eagle WWTF | NE0040916 | 0.410 | No | 33 | No |
| | NE3-31300 | Woodland Hills WWTF | NE0031640 | 0.015 | No | 30.8 | No |
| | NE3-31310 | Eagle Lake WWTF | NE0112895 | 0.031 | No | 34.5 | No |
| | NE3-50000 | Bennet WWTF | NE0123986 | 0.464 | No | 31.8 | No |

The primary natural source of *E. coli* is wildlife. A variety of wildlife is native to or have adapted to the diverse habitat of the Nemaha River Basin. Big game, furbearers, waterfowl, and non-game species have been documented to reside within the basin.

Animal feeding operations that have been issued State of Nebraska permits required for construction and operation of livestock waste control facilities (LWCF) if the operation has discharged, or has the potential to discharge, livestock waste waters of the State are also considered potential sources. These facilities are designed to contain any run-off that is generated by storm events that are less in intensity than the 25 year, 24 hour rainfall.

Point sources discharge or have the potential to discharge to waters in the Nemaha River Basin. Facility types include municipal wastewater treatment facilities and industrial facilities. Illicit connections, discharges, combined sewer overflows, sanitary sewer overflows, straight pipes from septic tanks or other on site wastewater systems can also be sources of *E. coli* bacteria though not are located in this basin.

Atrazine is one of the most heavily used pesticides in North America (EPA 2003). Given this usage and source, point and natural sources are likely not contributing atrazine to surface waters in Nebraska. Therefore, for this TMDL the entire load will be considered the result of nonpoint source discharges. All significant sources for atrazine and *E. coli* have been considered.

Allocation

Submittal identifies appropriate wasteload allocations for point, and load allocations for nonpoint sources. If no point sources are present the wasteload allocation is zero. If no nonpoint sources are present, the load allocation is zero.

A TMDL is defined as: $TMDL = LC = WLA + Background + MOS$

The LC for *E. coli* is based upon flow position in the hydrograph and is defined by:

$$LC = \text{Flow} \times 126/100 \text{ ml} \times C$$

The TMDL target is based on the numeric water quality criteria for atrazine of 12 ug/l. The assigned LC will be based on the stream flow volume and is defined by: $LC = \text{Flow} \times 12 \text{ ug/l} \times C$

WLA Comment

The *E. coli* WLA established by this TMDL will be a monthly geometric mean of 126/100 ml. The WLA will initially be applied to all facilities that discharge directly to a recreational segment. Specifically, the WLA assigned to these discharges shall be a seasonal geometric mean of $\leq 126/100 \text{ ml}$

The targeted WLA for *E. coli* are given by cfu/day loads by basin: NE1-10000 (1.44×10^{10} cfu/day); NE2-10000 (6.25×10^5 cfu/day); NE2-10600 (1.2×10^5 cfu/day); NE2-12100 (2.28×10^5 cfu/day); NE2-12130 (3.08×10^5 cfu/day); NE2-12200 (1.76×10^5 cfu/day); NE2-12330 (2.28×10^5 cfu/day); NE2-12500 (8.63×10^6 cfu/day); and NE3-10000 (3.76×10^5 cfu/day).

WLA for atrazine will be zero (0).

Flow hydrographs (0-100th percentile) used in the *E. coli* TMDL

LA Comment

To calculate daily loads, flow values are required. The flow values at percentile of flow exceedance are given by segment in the table below.

Flow hydrographs (0-100th percentile) used in the E. coli TMDL

| Percentile | Flow Value (cfs) | | | | | | | | |
|------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | NE1-10000 | NE2-10000 | NE2-10600 | NE2-12100 | NE2-12130 | NE2-12200 | NE2-12330 | NE2-12500 | NE3-10000 |
| 0 | 25,900 | 7 | 1.4 | 2.06 | 0.01 | 1 | 0.11 | 0.4 | 5 |
| 10 | 33,500 | 34 | 7 | 13 | 0.5 | 12 | 1.6 | 5.9 | 28 |
| 20 | 35,800 | 60 | 12 | 22 | 1.6 | 22 | 2.9 | 11 | 45 |
| 30 | 38,300 | 96 | 19 | 36 | 3.4 | 32 | 4.2 | 16 | 69 |
| 40 | 41,860 | 142 | 28 | 52 | 5.9 | 43 | 5.6 | 21 | 91 |
| 50 | 46,600 | 203 | 39 | 74 | 10 | 57 | 7.4 | 28 | 122 |
| 60 | 51,500 | 281 | 55 | 107 | 17 | 78 | 10 | 38 | 165 |
| 70 | 59,600 | 442 | 86 | 169 | 28 | 119 | 15 | 58 | 232 |
| 80 | 69,200 | 720 | 140 | 292 | 53 | 200 | 26 | 98 | 386 |
| 90 | 80,000 | 1,550 | 302 | 624 | 133 | 499 | 65 | 245 | 849 |
| 100 | 289,000 | 44,000 | 8,580 | 18,928 | 5,646 | 30,000 | 3,900 | 14,700 | 70,400 |

The targeted LA for E. coli are given by cfu/day loads. The LAs at median flow by segment are: NE1-10000 (1.44×10^{12} cfu/day); NE2-10000 (6.25×10^9 cfu/day); NE2-10600 (1.2×10^9 cfu/day); NE2-12100 (2.28×10^9 cfu/day); NE2-12130 (3.08×10^8 cfu/day); NE2-12200 (1.76×10^9 cfu/day); NE2-12330 (2.28×10^8 cfu/day); NE2-12500 (8.63×10^8 cfu/day); and NE3-10000 (3.76×10^9 cfu/day).

The LA for atrazine is given by flow in the table below.

B-0-100TH Percentile Flows and Maximum Daily Loadings for Big Nemaha River for Atrazine

| RANKING/ PERCENTILE | FLOW VALUE (CFS) | MAXIMUM DALIY LOAD (KG/DAY) |
|---------------------|------------------|-----------------------------|
| 0 | 21 | 0.62 |
| 10 | 80 | 2.35 |
| 20 | 128 | 376 |
| 30 | 180 | 5.29 |
| 40 | 249 | 7.31 |
| 50 | 361 | 10.61 |
| 60 | 525 | 15.44 |
| 70 | 781 | 22.94 |
| 80 | 1172 | 34.44 |
| 90 | 2090 | 61.42 |
| 100 | 36400 | 1070 |

The entire LC uses the LA, and example at the 50%, flow of 361 cfs the LA would be 10.61 kg/day Atrazine.

Margin of Safety

Submittal describes explicit and/or implicit margin of safety for each pollutant. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided.

To account for uncertainty in the nonpoint source load reduction, the targeted reductions will be set at 90% of the water quality target (126/100ml). Specifically the reductions shall be applied to meet a seasonal geometric mean of $\leq 113/100\text{ml}$.

Decay and/or die off of *E. coli* were not accounted for in either the source assessment or in establishment of the load reduction. That is, the entire concentration/load from the source was assumed to be present within the waterbody and the reductions should focus on the load.

This is an explicit margin of safety of 10% of the *E. coli* standard concentration.

For atrazine the MOS is implicit. Assessment of the data and the TMDL focused on the critical period where application of atrazine occurs. Implementation of controls will result in year round protection of water quality. This will be important should application practices change in the future.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s).

The *E. coli* water quality criterion is associated with the Primary Contact Recreation beneficial use and only applies from May 1 through September 30. Therefore, the critical conditions for these TMDLs will be those occurring from May 1 through September 30.

The critical environmental conditions for this TMDL for atrazine have been identified in the assessment process. Specifically, the data and information will be limited to the May through June time frame when the deviations from the water quality criteria were observed.

Public Participation

Submittal describes public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s).

The availability of the TMDLs in draft form was published in the Falls City Journal, Lincoln Journal Star and the Nebraska City News-Press with the public comment period running from May 14, 2007 to June 18, 2007. These TMDLs were also made available to the public on the NDEQ's internet site and interested stakeholders were informed via email of the availability of the draft TMDLs. No comments were received during the public participation period.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies the monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used).

Future NDEQ monitoring will generally be consistent with the ambient monitoring and rotating basin monitoring scheme. The Nemaha River Basin was monitored in 2004 and will again be targeted in 2009. An effort will be made to expand the monitoring to isolate areas of concern and to focus resources to address identified problems.

Periodically, compliance monitoring will be conducted at NPDES permitted facilities to verify permit limitations are being adhered to. Facilities are selected either randomly or in response to inspection or reported information.

As well, the NPDES permits require self-monitoring of the effluent by the permittee with the frequency of the monitoring being based on the discharge characteristics. The data is then reported to NDEQ quarterly, semiannually or annually and entered into the EPA's Permitting Compliance System. The compliance monitoring and self-monitoring information will be used in assessing the success of the TMDL.

Reasonable assurance

Reasonable assurance only applies when reductions in nonpoint source loading is required to meet the prescribed waste load allocations.

Reasonable assurance is not required as the WLA for all point sources are set at a level that will attain *E. coli* WQS. For atrazine the WLA=0 so reasonable assurances do not apply.